CodeHS

Python Basics with Tracy the Turtle 1 Course Syllabus

1 Semester for Middle School, 60 hours

Course Overview and Goals

The Python Basics with Tracy the Turtle 1 course teaches students the basics of programming in Python. Students learn Python commands, functions, control structures, and user interaction by solving puzzles and writing creative programs for Tracy to follow.

Learning Environment: The course utilizes a blended classroom approach. The content is a mix of web-based and physical activities. Students will write and run code in the browser and engage in in-person collaborative exercises with classmates. Teachers utilize tools and resources provided by CodeHS to leverage time in the classroom and give focused 1-on-1 attention to students.

Programming Environment: Students write and run programs in the browser using the CodeHS online editor.

Prerequisites: The Python Basics with Tracy the Turtle 1 course is designed for complete beginners with no previous background in computer science. The course is highly visual, dynamic, and interactive, making it engaging for those new to computer science.

Extensions: The Python Basics with Tracy the Turtle 2 course can be used to follow this course, which will expand on the concepts learned in this semester. Browse the content of that course at https://codehs.com/course/21069.

More information: Browse the content of this course at https://codehs.com/course/21070.

Course Content

Quizzes: Each lesson includes at least one formative short multiple choice quiz. At the end of each module, a summative quiz is included.

Challenges & Projects: Two different types of projects can be found in this course:

- At the end of each module, students will add on to an *Etch a Sketch* project, applying new concepts they've learned to expand on the project they've been creating.
- At three points in the course, after learning new content, students will reach project modules where they will complete a larger project from start to finish. These projects are a bit more open-ended and allow students to be more creative in applying their knowledge. These projects are:
    - Design a Mural
    - Cycle Depiction
    - On-Screen Calculator

Trace Table Documents: Trace table handouts are used throughout the course to push students to dissect a program and understand what is happening line by line. These can be accessed by students virtually or can be printed out to be completed physically.

Course Breakdown

Unit 1: Tracy's World (1 week/ 5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21070/module/28288

Objectives / Topics Covered	• What is a command? • How do we communicate with computers? • Moving Tracy • Drawing circles • History of programming languages • Why is Python such a popular language? • Tracy's coordinate system

Example Assignments / Labs	• 11 exercises total
	• Commands
	  ○ Drawing simple graphics
	  ■ Example Exercise: Caterpillar
	  Combine multiple commands to write a program that has Tracy draw 5 circles in a row
	• Programming Languages
	  ○ Learn about characteristics of programming languages
	  ■ Example Exercise: Programming Language Hierarchy
	  Drag and drop programming languages into a hierarchy based on characteristics of the language

Unit 2: Moving Tracy (1 week/ 5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21070/module/28289

Objectives / Topics Covered	• Testing your own Tracy programs • Turning Tracy at right angles • For loops • Using coordinates and angles to move Tracy's position

Example Assignments / Labs	• 13 exercises total
	• Turning Tracy at Right Angles
	  ○ Learn how to use the left and right commands to let Tracy explore more of her world
	  ■ Example Exercise: 4 Columns
	  Write a program that will have Tracy split her world into 4 columns by drawing 3 vertical lines 100 pixels apart
	• For Loops
	  ○ For loops execute the code inside the loop a set number of times.
	  ■ Example Exercise: Row of Circles
	  In this program, Tracy should draw a row of circles across the width of the canvas using a for loop.
	• Using Coordinates and Angles to Move Tracy's Position
	  ○ Any angle can be used to have Tracy draw shapes with diagonal lines.
	  ■ Example Exercise: Hexagon
	  Write a program, using for loops, that has Tracy draw a hexagon on the canvas.

Unit 3: Designing and Communicating Solutions (1.5 weeks/ 8 hours)

Browse the full content of this unit at https://codehs.com/library/course/21070/module/28290

Objectives / Topics Covered	• Commenting your code • Naming rules in Python • Functions • Artistic commands • Adding text • Top down design

Example Assignments / Labs	• 13 exercises total
	• Commenting Your Code
	  ○ Commenting is important to make sure your code is understandable to yourself and others.
	  ■ Example Exercise: Circle Pyramid with Comments
	  Take your Circle Pyramid program from earlier and add comments to explain what your program is doing.
	• Functions
	  ○ Teach Tracy new commands by grouping a set of commands that can be called with one line of code.
	  ■ Example Exercise: Shape Stack
	  Give Tracy instructions to draw a tower of squares and circles from the bottom to the top of the canvas.
	• Artistic Commands
	  ○ There are many ways to get creative with the graphics Tracy draws, such as using color, filling in shapes, and leaving trails with varying thicknesses.
	  ■ Example Exercise: Kid's Shapes Toy
	  Write a program to have Tracy draw a representation of a popular toy used to teach children shapes and colors. There should be 4 different shapes with 4 different colors.
	• Adding Text
	  ○ Text can be added to the canvas using the **`write`** command
	  ■ Example Exercise: Baseball Diagram
	  Label the parts of the baseball field.
	• Top Down Design
	  ○ Solve large Tracy problems by breaking them down into smaller, more manageable problems.
	  ■ Example Exercise: Bubble Wrap 2.0
	  In this program, Tracy will add highlights to each bubble from our Bubble Wrap example program. Use top down design to break this large problem into smaller pieces!

Unit 4: [Project] Design a Mural (1 week/5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21070/module/28718

Objectives / Topics Covered	• Review all concepts through this point
Example Assignments / Labs	• 2 exercises total • Design a Mural ○ Research and design a mural or piece of artwork using the Tracy commands you've learned so far!

Unit 5: Controlling Tracy with Variables (3 weeks/ 15 hours)

Browse the full content of this unit at https://codehs.com/library/course/21070/module/28291

Objectives / Topics Covered	• Variables • Data types • Strings • User input • Parameters • Clickable interaction • Debugging • The value of i in for loops

Example Assignments / Labs	• 33 exercises total
	• Variables
	  ○ Variables are used to store and manipulate values in our programs.
	  ■ Example Exercise: Dart Board
	  Write a program that uses variables to draw a dart board which consists of 4 concentric circles that each increase in radius by 25 pixels.
	• Data Types
	  ○ In this course, we will look at 4 data types: Strings, Integers, Floating Point Numbers, and Booleans
	  ■ Example Exercise: Categorizing Variables
	  Write variable values in their correct data type category.
	• Strings
	  ○ Strings can be manipulated using string methods.
	  ■ Example Exercise: Text Messaging
	  Edit the contents of a text conversation between you and a friend using string methods.
	• User Input
	  ○ We can use input from a user to control certain commands in our code and make our programs more personalized.
	  ■ Example Exercise: Four Corners
	  User input will dictate the length of the sides of a square. Squares of the indicated size will be drawn in each corner of the canvas.
	• Parameters
	  ○ Parameters can be used to customize functions to make them more reusable.
	  ■ Example Exercise: Colorful Caterpillar
	  Use parameters to draw a caterpillar with 8 body circles of 4 different colors.
	• Clickable Interaction
	  ○ Users can interact with Tracy programs using their mouse.
	  ■ Example Exercise: Click Counter
	  Each time the user clicks the canvas, update and display the number of times the screen has been clicked.
	• The Value of i in For Loops
	  ○ The value of i in a for loop is actually a variable! It can be altered and used to control commands in our code.
	  ■ Example Exercise: Dart Board Using i
	  Alter your previous Dart Board program to use the value of i to control the circle's radius instead of a separate variable.

Unit 6: [Project] Cycle Depiction (1 week/ 5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21070/module/28733

Objectives / Topics Covered	• Review all concepts through this point
Example Assignments / Labs	• 2 exercises total • Cycle Depiction ○ Research and design a visual display of a common cycle, including user interaction in some way.

Unit 7: Making Decisions (1.5 weeks/ 8 hours)

Browse the full content of this unit at https://codehs.com/library/course/21070/module/28292

Objectives / Topics Covered	• If statements • If/else statements • Returning values from functions • While loops

Example Assignments / Labs	• 18 exercises total
	• If Statements
	  ○ If statements will execute code only if certain conditions are met
	  ■ Example Exercise: Happy Face
	  Write a program that will draw a happy face on the screen if the user answers that they are happy.
	• If/Else Statements
	  ○ The if/else statement executes a block of code if a specified condition is true. If the condition is false, another block of code can be executed.
	  ■ Example Exercise: Rating
	  Write a program that shows a graphical representation of a user's rating value. If the value is between 1 and 4, draw a red X. If it is between 5 and 7, draw a yellow horizontal line. If it is an 8 or above, draw a green checkmark.
	• Returning Values from Functions
	  ○ Functions can return values back to the main program using the **`return`** keyword.
	  ■ Example Exercise: Apple Watch Messages
	  Display a message to the user based on the random time of day that is generated.
	• While Loops
	  ○ A while loop allows code to be executed repeatedly based on a given Boolean condition.
	  ■ Example Exercise: Increasing Squares
	  Write a program that has Tracy draw concentric squares form the center of the canvas until the length variable reaches 400 pixels.

Unit 8: Putting It All Together (0.5 weeks/ 2 hours)

Browse the full content of this unit at https://codehs.com/library/course/21070/module/28293

Objectives / Topics Covered	● Control Structures ● Commands ● Defining versus Calling Functions ● Control flow ● Looping ● Conditionals ● Commenting code ● Top Down Design
Example Assignments / Labs	● Challenges ○ Students use all of the skills learned in the course to solve complex puzzles and challenges. ■ Example Exercise: Guess a Number 2.0 Write a program that allows the user to guess a secret number. If their number is too high, draw a down arrow. If their number is too low, draw an up arrow. If they guess the number, draw a checkmark and end the program.

Unit 9: [Project] On-Screen Calculator (1.5 weeks/ 7 hours)

Browse the full content of this unit at https://codehs.com/library/course/21070/module/28734

Objectives / Topics Covered	● Review all concepts through this point
Example Assignments / Labs	● 4 exercises total ● On-Screen Calculator ○ Design a calculator that can be used to perform simple mathematical expressions.